ABSTRACT

Evidence about the health hazards of exposure of humans and animals to a wide rang of chemical and physical pollutants, especially pesticides and radiations, were reported in several articles, while the mutagenic and/or the carcinogenic effects are conflicting and inconclusive. Various genotoxic effects have been reported, including chromosomal damage, induction of micronuclei and sister chromatid exchange in different experimental models as well as DNA damage.

On the other hand, laser therapy has gained wide acceptance and application in many medical disciplines. Nevertheless, during surgical procedures, the thermal destruction of tissue creates a smoke plume. Recent research data indicate that pyrolysates liberated during vaporisation of tissue induce DNA damage. However, assessing potential health hazards during medical laser treatment requires comprehensive insight into the cytotoxic, genotoxic, clastogenic and mutagenic capacity of laser pyrolysis products (LPP) **(Plappert *et al.*, 1999).**

During the last 10 years, a rapid and sensitive technique, the comet assay [single-cell gel electrophoresis (SCGE)] has gained widespread acceptance for genotoxicity testing. Compared with other genotoxicity tests, the comet assay is a cheap and simple method. Although the comet assay requires isolated cells of the

same type, there has been increasing interest in this test in the last years, mainly because of its advantages, sensitivity and rapidity. The comet assay permits the detection of primary DNA damage and the study of repair kinetics at the level of single cells. It has recently been used for various *in vitro* and *in vivo* studies to monitor exposure to mutagens and carcinogens that induce DNA damage **(Qiu, *et. al.*, 2003).**

In the present study, the alkaline comet assay was used to evaluate the genotoxic effects of a type II synthetic pyrethroid pesticide (cypermethrin) and laser radiations (diode laser (650 nm) 500mw) on the liver cells of white rats.

Sixty-six apparently healthy adult male Swiss albino rats were used in the present study. Rats, weighing 120-180 g, approximately 4 months old of age. Animals were randomized by weight. Rats were randomly divided in to experimental groups and sub-groups (3 animals/ group) as follows:

1. Control (-) no treatment.
2. Control (+) treated by H_2O_2.
3. Treatment the cypermethrin treated animal groups were exposed orally to a single dose of one of three different dose levels (1/5, 1/10 or 1/30 LD_{50}) and different sacrificed time (1,7,14 days). Cypermethrin was solubilized in water.

4. Treatment the diode laser (650 mm) treated animal groups were exposed to a single dose for one of three different durations (1, 5 or 10 min.) and different sacrificed time (1,7,14 days).

5.Combination treatment between Laser and Cypermethrin:

a. Low dose of cypermethrin (1/30 LD_{50}) with low dose of diode laser (1 min), sacrificed after 14 days.
b. High dose of Cypermethrin 1/5 LD_{50}, after 6 days exposure of high laser (10 min), then sacrificed after 1 day.

The results of cypermethrin indicated that all pesticide treatments alone yielded statistically significant DNA damage ($P<0.0001$). The DNA damage increased with the increased of the concentration of dose levels. While, the results of diode laser (650nm) showed that highly statistically significant increase of damaged DNA ($P<0.0001$). Also, DNA damage decreased with the increase of the time after exposure. Combination treatments of low dose or high dose of both cypermethrin and diode laser increased the damage DNA, ($P<0.0001$) for low dose and ($P<0.0001$) for high dose, respectively.

Taken together, our results show that the SCG test is a sensitive genotoxicity test for different DNA damaging by chemical and physical agents. The results of the present study clearly indicate that each of cypermethrin and laser irradiation

alone possesses the potential to cause alterations in the cellular DNA in rat liver cells ***in vivo***, indicating potential mutagenic effects. It could be suggested that the combination of cypermethrin treatment with laser irradiation would have a synergistic genotoxic effect as cypermethrin may cause DNA damage, scission of DNA synthesis and/or inhibition of DNA repair. Human exposure to these agents should be restricted.

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